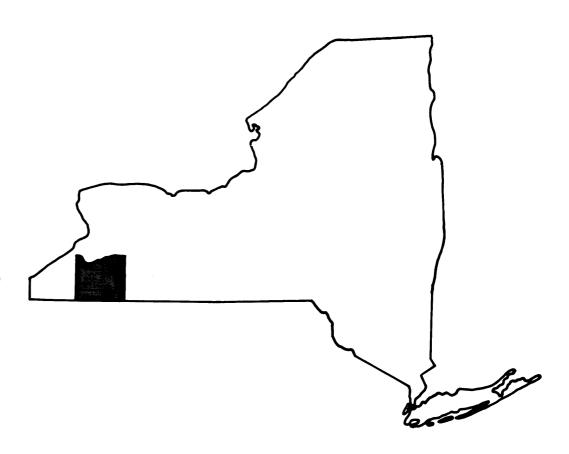


TOWN OF HINSDALE, NEW YORK CATTARAUGUS COUNTY



JULY 1978

U.S. DEPARTMENT of HOUSING & URBAN DEVELOPMENT FEDERAL INSURANCE ADMINISTRATION

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FLOOD INSURANCE STUDY TOWN OF HINSDALE, NEW YORK

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the Town of Hinsdale, Cattaraugus County, New York, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert the Town of Hinsdale to the regular program of flood insurance by the Federal Insurance Administration (FIA). Further use of this information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

The purpose of the Flood Insurance Study was explained at a meeting held on July 31, 1975, with representatives of the FIA, the Town of Hinsdale, the Cattaraugus County Planning Board, the New York State Department of Environmental Conservation (the Study Contractor), the U. S. Army Corps of Engineers (COE), and the U. S. Department of Agriculture, Soil Conservation Service (SCS).

On November 17, 1976, a meeting was held with officials of the town to obtain additional local input. The final Consultation and Coordination Officer's meeting was held on February 23, 1977, where the final draft of the Flood Insurance Study was presented for further local comment. The meeting was attended by the Town Supervisor, the Town Clerk, several town officials and approximately 40 town residents.

1.3 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by the New York State Department of Environmental Conservation for the Federal Insurance Administration, under Contract No. H-3856. This work, which was completed in December 1976, covered all significant flooding sources in the Town of Hinsdale.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Hinsdale. The area of study is shown on the Vicinity Map (Figure 1).

Because of the density of development within the flood plain areas and the frequency of flood problems, it was agreed by the FIA and the Town of Hinsdale that Olean and Ischua Creeks and part of Oil Creek in the town, with a total length of 7.91 miles, were to be studied in detail. The remainder of Oil Creek and the entirety of Haskell Creek, which flow through undeveloped areas of the town, were agreed to be studied by approximate methods.

The areas studied in detail were chosen with consideration given to all forecasted development and proposed construction for the next five years, through March 1980.

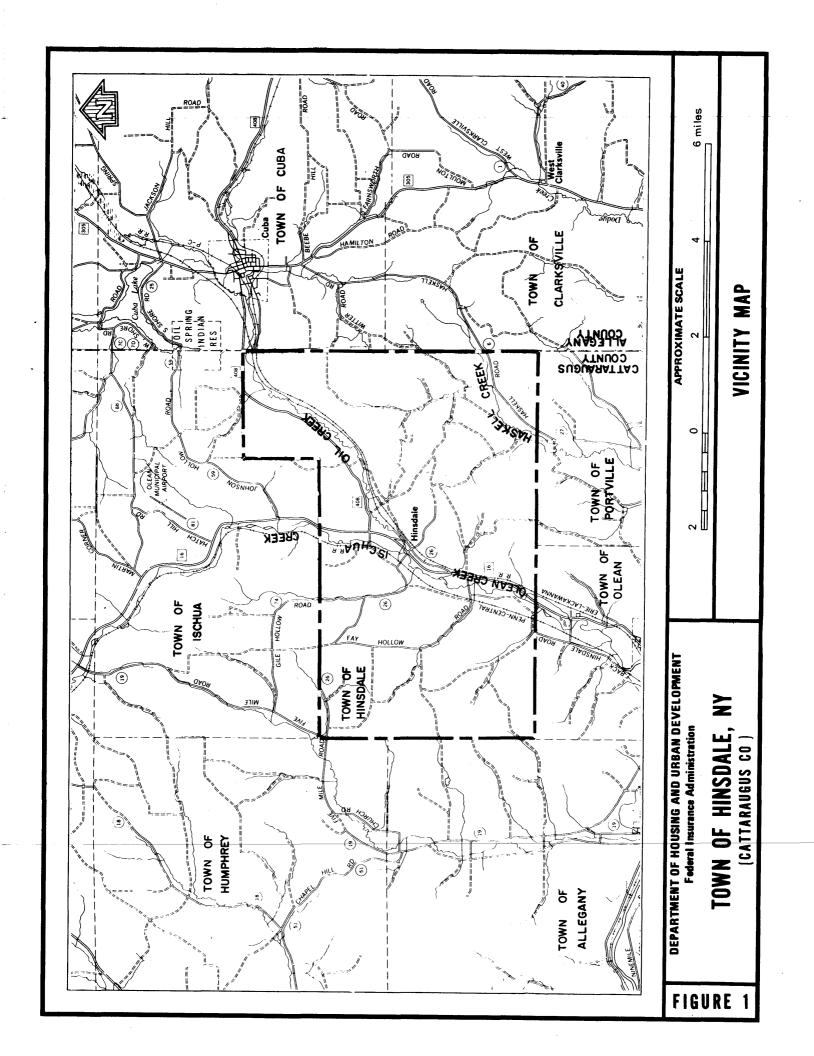
2.2 Community Description

The Town of Hinsdale is located in the southeast corner of Cattaraugus County in western New York State, approximately 2 miles north of the City of Olean. The town is primarily residential and agricultural in nature, and has experienced a steady growth of 15 percent per decade over the last half century. The current population, taken from the 1970 census, is 1,781 persons (Reference 1).

The town consists of two varied physiographic areas; one is hilly uplands, which are generally wooded and have elevations up to 2,200 feet, and the other is flat valley bottomland along the streams and watercourses, with elevations around 1,450 feet (Reference 2).

Climate is typical of temperate continental areas with some local variations due to elevation differences. Average January and July temperatures are 25°F and 67°F, respectively. Total precipitation is about 37 inches, resulting in approximately 21 inches of runoff (Reference 3).

Olean Creek, which has a total drainage area of 204 square miles at its mouth, is formed in the center of the Town of Hinsdale by the confluence of Oil Creek and Ischua Creek. Oil Creek, which rises in the Town of Cuba, has a drainage area of 63 square miles,



and Ischua Creek, which rises in the Town of Farmersville, has a drainage area of 115 square miles. Olean Creek continues south through the Town of Hinsdale and the City of Olean to its junction with the Allegheny River at the southern edge of the city. The Allegheny River, which rises in Potter County, Pennsylvania, on the western slope of the Appalachian Mountains, flows in a wide loop through a portion of New York State and eventually merges with the Monongahela River at Pittsburgh to form the Ohio River.

Olean Creek flows southerly through the south-central portion of the town for a distance of 17,700 feet. Ischua Creek crosses the northern corporate limits of the Town of Hinsdale and continues south for a total distance of 11,500 feet to join Oil Creek, forming Olean Creek. Haskell Creek begins in the Town of Clarksville, and flows southwest from the eastern town limits of the Town of Hinsdale for a distance of 14,500 feet to the southern town limits where it flows into the Town of Portville.

The flood plains in the Town of Hinsdale are rural in character with much of the lands occupied by roads and residential and agricultural development.

2.3 Principal Flood Problems

Due to the steep terrain of the surrounding area, Hinsdale is subject to flash flooding from cyclonic disturbances of high intensity, even if such storms are of short duration. Floods most frequently result from these disturbances in winter or early spring, augmented by melting snow.

There are no dependable records of major flooding or damage estimates within the town. The U. S. Geological Survey (USGS) has maintained a gaging station on Olean Creek in the Town of Olean, downstream from the Town of Hinsdale. The gage has a relatively short period of record (1950 to date). Interviews with local residents indicate that the flood of September 1967 is the maximum known event for Olean, Ischua, and Oil Creeks. The estimated discharge for the September 1967 flood at the gage in the Town of Olean was 18,200 cfs. There is not sufficient information to establish an estimate of the recurrence interval for this event.

2.4 Flood Protection Measures

There are no existing or planned flood protection structures in the area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Floods having recurrence intervals of 10, 50, 100, and 500 years have been selected as having special significance for flood plain management and for flood insurance premium rates. The analyses reported here reflect current conditions in the watersheds of the flooding sources.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail in the community.

A synthetic rainfall-runoff relationship method based on a dimensionless unit hydrograph was used to develop flood flow-frequency relationships. The 24-hour rainfall amounts for frequencies up to 100 years, as obtained from the Rainfall Frequency Atlas (Reference 4), were plotted on log-normal paper and the rainfall amount for the 500-year frequency was extrapolated from the resulting graph. The drainage area of each stream was divided into sub-areas to evaluate the hydrologic effects of tributaries.

The computer program TR-20, developed by the SCS, was used to compute surface runoff (Reference 5). It takes into account conditions affecting runoff such as land use, type of soil, shape and slope of watershed, antecedent moisture conditions, etc. It develops a hydrograph and routes the hydrograph through stream channels and reservoirs. The program is designed to combine the routed hydrograph with those from other tributaries and print out the total composite hydrograph peak discharges and times of occurrence at each desired point in the watershed for each storm evaluated. From this data, frequency-discharge drainage area curves were plotted for each evaluation point. The peak discharges for the 10-, 50-, 100-, and 500-year floods of the streams studied in detail in the town are shown in Table 1, "Summary of Discharges."

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams studied in detail in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of these streams.

TABLE 1 - SUMMARY OF DISCHARGES

	DRAINAGE AREA	P	EAK DISCH	ARGES (cfs)
FLOODING SOURCE AND LOCATION	(sq. Miles)	10-YEAR	50-YEAR	100-YEAR	500-YEAR
OLEAN CREEK Downstream corporate limits Fay Hollow Road	s 191.3 185.8	11,500 10,000	17,500 15,200	20,500 17,800	29,000 25,300
ISCHUA CREEK Confluence with Oil and Olean Creeks	114.8	5,500	7,150	7,800	9,400
OIL CREEK Confluence with Ischua and Oil Creeks	63.1	4,200	6,100	7,000	9,100

Flood profiles for Ischua and Oil Creeks were computed using the SCS WSP-2 Water-Surface Profiles Computer Program (Reference 6). The SCS program uses the standard step-backwater method, with some modifications, to compute profiles between valley sections. All profiles are computed in the upstream direction. Therefore, only subcritical flow, a condition normally characteristic of natural streams, can be analyzed. For any super-critical flows encountered, the program will assume critical depth and resume computations.

Flood profiles on Olean Creek were computed using the COE HEC-2 step-backwater computer program (Reference 7). Profiles were determined for the 10-, 50-, 100-, and 500-year floods. The program applies theorems for total energy and friction loss to calculate the water-surface elevation for each cross section of a river channel.

Cross sections were located at close intervals above and below the bridges, at control sections along the stream length, and at significant changes in ground relief, land use, or land cover. Reach lengths for the channel were measured along the centerline of channel and overbank reach lengths were measured along the approximate centerline of the effective overbank flow areas.

Roughness coefficients (Manning's "n") were determined by field inspection and based on the <u>National Engineering Handbook</u> (Reference 8). In arriving at a realistic value, due weight was given to the natural materials of which the channel was composed, surface irregularity, variations in shape and size of cross sections, characteristics of obstructions such as debris deposits,

stumps, exposed roots, boulders, fallen and lodged logs, type of vegetation, and degree of meandering.

A summary of the range of roughness coefficients for channel and overbank areas for the streams studied in detail is presented below.

	RANGE OF M	ANNING'S "n"
FLOODING SOURCE	CHANNEL	OVERBANK AREAS
Olean Creek	0.035	0.050
Ischua Creek	0.045-0.07	0.07-0.095
Oil Creek	0.05-0.06	0.065-0.09

The frequency discharge, drainage area curves at each cross section were used to develop the corresponding stage-frequency relationships for Ischua and Oil Creeks.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross-section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 3).

All elevations are referenced to the National Geodetic Datum of 1929 (NGVD), formerly referred to as Sea Level Datum of 1929. The locations of the elevation reference marks used in the study are shown on the maps.

Flood elevations in the Town of Hinsdale are often raised by ice jams during spring thaws; the hydraulic analyses for this study, however, are based only on the effects of unobstructed flow. The hydraulic structures in general remain unobstructed and do not fail.

For the two streams studied by approximate methods, USGS flood height-drainage area curves for the 100-year flood were utilized (Reference 9). Drainage areas were developed at selected locations from USGS 7.5 Minute Series Topographic Maps (Reference 10). The 100-year flood heights were then extracted from the curves and USGS 7.5 Minute Topographic Maps were used for differential elevation references.

No flood height-drainage area relations have been developed by the USGS for the Allegheny River Basin. However, the upper Genesee River Basin, immediately to the east of the Allegheny River Basin has definite hydrologic and hydraulic similarities to the area of study and was used in these analyses.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage State and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps developed for this study from aerial photographs at a scale of 1"=400' with a contour interval of five feet (Reference 11).

For the streams studied by approximate methods, the 100-year flood boundaries were delineated using the topographic maps referenced above.

The boundaries of the 100-year and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 3). In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown. Small areas within the flood boundaries may lie above the flood elevations and, therefore, may not be subject to flooding. Owing to limitations of the map scale and lack of detailed topographic data, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The floodways for Oil and Ischua Creeks were computed using the <u>HUD-15</u> Computer Program (Reference 12). The floodway for Olean Creek was computed by the HEC-2 step-backwater computer program (Reference 7). Where special topographic features required it, the floodway was adjusted more toward one side of the stream as necessary. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 3), the floodway boundaries were determined at cross sections; between cross sections the boundaries were interpolated. In cases where the floodway and 100-year boundaries are close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood

FLOODII	FLOODING SOURCE		FLOODWAY		WATE	BASE FLOOD WATER SURFACE ELEVATION	ATION
CROSS SECTION	DISTANCE	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Olean Creek	l						(
Ą	1,300	1,431	5,955	3.44	1,438.7	1,437.8	o.0
Д	2,070	1,455	13,596	1.51	1,439.2	1,438.3	6.0
U	3,820	1,5763	12,074	1.70	1,439.4	1,438.4	1.0
Ω	4,570	913	7,281	2.82	1,439.5	1,438.5	1.0
Ŀì	5,970	1,076	8,872	2.31	1,439.6	1,439.0	0.6
Ēų	7,670	240	1,906	10.76	1,439.6	1,439.1	0.5
ტ	8,740	603	990'9	2.93	1,444.3	1,443.7	9.0
н	10,790	,008	6,641	2.68	1,444.9	1,444.2	0.7
н	12,560 1	1,130	7,732	2.30	1,445.5	1,444.8	0.7
b	14,380 1	239	2,091	8.51	1,446.1	1,445.4	0.7
M	15,820 1	643	3,942	4.52	1,449.4	1,448.4	1.0
ы	17,600 1	772	2,090	3.50	1,451.5	1,450.8	0.7
Ischua Creek	(•
Ą	1,830 2	202	1,725	4.52	1,453.0	1,452.0	1.0
щ	3,190 ²	770	2,698	2.89	1,455.0	1,454.0	1.0
υ	4,090 2	280	1,731	4.51	1,457.5	1,456.5	1.0
							·

FLOODWAY DATA

 3 THIS WIDTH INCLUDES AREAS NOT INUNDATED BY THE 100-YEAR FLOOD

OLEAN CREEK AND ISCHUA CREEK

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration

1 FEET ABOVE CORPORATE LIMITS 2 FEET ABOVE MOUTH

TOWN OF HINSDALE, NY (CATTARAUGUS CO.)

FLOODI	FLOODING SOURCE		FLOODWAY		WATER	BASE FLOOD WATER SURFACE ELEVATION	ATION
CROSS SECTION	DISTANCE ¹	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Ischua Creek							
(Continued)							,
Д	4,990	740	2,000	3.90	1,459.2	1,458.2	1.0
щ	6,140	441	2,385	3.27	1,462.0	1,461.0	1.0
Ĺ	7,740	609	3,473	2.25	1,465.7	1,464.7	1.0
ტ	8,820	656	1,817	4.29	1,468.0	1,467.0	1.0
Ħ	088,6	561	2,641	2.95	1,471.0	1,470.0	1.0
Oil Creek		c					
Ą	1,455	445 4	2,232	3.14	1,454.1	1,453.1	1.0
Д	2,555	848	5,893	1.19	1,454.4	1,453.4	1.0
υ	3,535	669	4,505	1.55	1,455.0	1,454.0	1.0
Q	4,935	203	1,773	3.95	1,455.8	1,454.8	1.0
ы	6,515	249	2,924	2.39	1,462.9	1,461.9	1.0
Ĺτι	6,815	329	3,725	1.88	1,463.0	1,462.0	1.0
ტ	7,815	370	3,471	2.02	1,463.3	1,462.3	1.0
н	8,545	399	4,241	1.65	1,463.5	1,462.5	1.0
Н	9,595	387	3,940	1.78	1,464.1	1,463.1	1.0
	·						
	-						

 2 тні 2 width does not include the ischua creek floodway

1 FEET ABOVE MOUTH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration

TOWN OF HINSDALE, NY (CATTARAUGUS CO.)

FLOODWAY DATA

ISCHUA CREEK AND OIL CREEK

TABLE 2

FLOODIN	FLOODING SOURCE	-	FLOODWAY		WATER	BASE FLOOD WATER SURFACE ELEVATION	ATION
CROSS SECTION	DISTANCE1	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Oil Creek (Continued) J K	10,965	399 294	4,632	1.51 2.36	1,464.3	1,463.3	1.0

FLOODWAY DATA

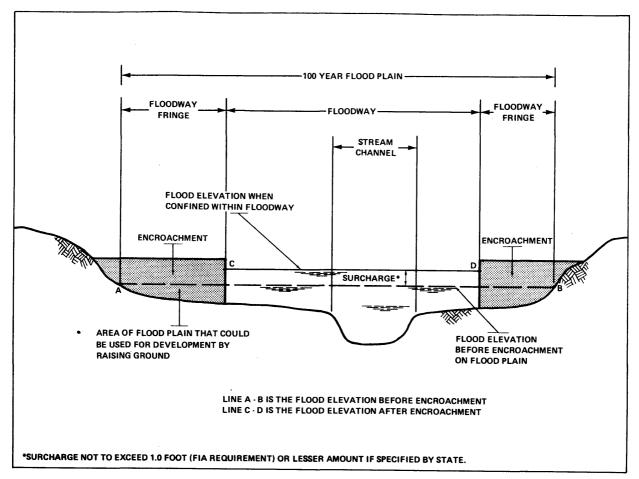
OIL CREEK

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration

1 FEET ABOVE MOUTH

TOWN OF HINSDALE, NY (CATTARAUGUS CO.)



FLOODWAY SCHEMATIC

Figure 2

insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each flooding source affecting the Town of Hinsdale.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between	
10- and 100-Year Floods	<u>Variation</u>
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot

Five reaches meeting the previous criteria were required for the flooding sources of Hinsdale. These included one on Olean Creek, two on Ischua Creek, and two on Oil Creek. The locations of these reaches are shown on the Flood Profiles (Exhibit 1).

5.2 Flood Hazard Factors

The FHF is the FIA device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Town of Hinsdale was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:

Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods, no base flood elevations shown or FHFs determined.

Zones A2, A3, A5, A7:

Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.

Zone B:

Areas between the Special Flood Hazard area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure, also areas subject to

certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C:

Areas of Minimal flooding, including areas that are protected from 100- and 500-year floods by dike, levee, or other water control structure, not subdivided.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the Town of Hinsdale.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Hinsdale, is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot watersurface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

Flood Insurance Studies are currently underway by the study contractor for other communities within the Allegheny River Basin. The communities of the Town of Allegany, Town of Portville, Town of Olean, Town of Ischua, and the Town of Cuba are contiguous to the Town of Hinsdale and are being studied at this time (References 13 through 17). Hydraulic analyses have been coordinated to insure that the water-surface elevations will match at the corporate limits.

This study is authoritative for purposes of the Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Federal Insurance Administration, Regional Director, 26 Federal Plaza, New York, New York 10007.

		ELE	ELEVATION DIFFERENCE	NCE ²			BASE FLOOD
FLOODING SOURCE	PANEL1	BEIWEEN	BEIWEEN 1.0% (100-YEAR) FLOOD AND	LUUD AND	FHF	ZONE	ELEVATION ³
		10% (10-YR.)	2% (50-YR.)	0.2% (500-YR.)			(NGVD)
Olean Creek Reach l	10	-2.5	9.0-	+1.7	025	A5	Varies
Ischua Creek Reach 1 Reach 2	10	-1.3 -0.9	0.3	+1.0	015	A3	Varies Varies
Oil Creek Reach l Reach 2	5,10 5	-1.5	-0.5	+1.0	015	A3 A7	Varies Varies

1FLOOD INSURANCE RATE MAP PANEL
2WEIGHTED AVERAGE
3ROUNDED TO NEAREST FOOT — SEE MAP

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration

TOWN OF HINSDALE, NY (CATTARAUGUS CO.)

FLOOD INSURANCE ZONE DATA

OLEAN CREEK, ISCHUA CREEK AND OIL CREEK

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